# DISTILLATION OF KEY POINTS FROM FOUR DOCUMENTS ABOUT THE BAY-DELTA (08/31/11)

I sought to distill and combine the essence of interagency actions pertaining to the topics addressed by the ANPR. I read/skimmed (many) hundreds of pages of technical and policy reports. Language from each document is color-coded and grouped under the topics, and especially meaningful language is highlighted with **bold** font. My observations and recommendations are written in red .

Delta Stewardship Council's ***Fifth Staff Draft Delta Plan***
http://deltacouncil.ca.gov/delta-plan

**SWRCB's** ***Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem*** (2010)
http://www.swrcb.ca.gov/waterrights/water_issues/programs/bay_delta/deltaflow/final_rpt.shtml

**CDFG's** ***Conservation Strategy for Restoration of the Sacramento-San Joaquin Delta Ecological Management Zone and the Sacramento and San Joaquin Valley Regions*** (2010)
http://www.dfg.ca.gov/ERP/reports_docs.asp

CDFG's ***Quantifiable Biological Objectives and Flow Criteria for Aquatic and Terrestrial Species of Concern Dependent on the Delta*** (23 November 2010)
http://www.dfg.ca.gov/water/water_rights_docs.html

## ECOSYSTEM MANAGEMENT

In 2008, the CALFED Science Program released a report synthesizing the state of knowledge about ecological processes, habitats, stressors, and species in the Delta…**The capacity of the system to deliver human, economic, and environmental services is likely at its limit**, so tradeoffs must be made – **fulfilling more of one water-using service means accepting less of another** (CDFG *Quantitative*...p. 5)

…**the State cannot effectively plan, finance, and build new conveyance and storage facilities to improve the reliability of water exports from the Delta watershed when future Bay-Delta Water Quality Control Plan objectives and flow requirements are not known**…(DSC p.)

Comprehensive Flow Criteria: "Bottom Up" Accumulation of Functional Flows (Fleenor et al. 2010) suggested an approach for establishing flow criteria that does not rely on past flow conditions, and that might not represent current conditions:

1. …encourage the need to be **comprehensive yet not overly complex.**
2. …**identify…geographic locations…in need (flow-related biological objectives and) flow criteria**.
3. …review and modify flow criteria as new data and information comes to light.
4. …**review and modifications occur on a time frame to realistically manage desirable species**.

(CDFG *Quantitative*...p. 18)

## FLOWS & FISHES

**ER P1** SWRCB should update the Bay-Delta Water Quality Control Plan objectives and establish flows:
a) By June 2, 2014, adopt and implement updated flow objectives for the Delta…coequal goals.
b) By June 2, 2018, develop flow criteria for high-priority tributaries in the Delta watershed necessary to achieve the coequal goals. (This same policy is reiterated later in the Delta Plan regarding the management of salinity to protect human health & the environment; DSC pages 138-139)

**Management Goals • Integrate all flow measures needed to protect species and ecosystem functions in a manner that is comprehensive, does not double count flows**, uses a justified time step, and is documented in peer reviewed or otherwise vetted literature. (CDFG *Quantitative*...Ex. Sum.)
**ER R7** The Delta Science Program, CDFG, DWR, and SWRCB…*should…develop recommendations to… reduce stressor impacts*…For example…**options for varying salinity to reduce impacts of nonnative invasive species while providing overall ecosystem benefits and minimally disrupting water supply**.

**Salinity** (DSC p. 136-137) …the low salinity zone (LSZ)…is…the region with salinity ranging from freshwater up to about 5 practical salinity units (psu), about one-seventh the salinity of seawater. The part of the salinity gradient centered on 2 psu… is hypothesized to be an area where suspended particulate matter and organisms accumulate. The location in the Bay-Delta where the tidally averaged bottom salinity is 2 psu is known as X2…and serves as a water quality standard to regulate Delta outflow…**simply allowing more variability in Delta outflow will not produce the same salinity gradient patterns that existed before development**…Salinity from seawater mixing into the western Delta and salinity from the San Joaquin River (can create)…a Delta with a "freshwater corridor" leading from the Sacramento River to the export pumps…

**Delta Outflow and X2…data and findings continue to support the conclusion that X2 location (i.e. outflow) is an important metric for the habitat**…of several native estuarine species. For some species, the likely mechanisms have been identified (e.g., splittail and floodplain inundation), but other mechanisms remain to be deciphered. (CDFG p. 20)...the two Biological Opinions include Reasonable and Prudent Alternative (RPA)…restrict the amount of reverse flows…**and provide for new X2 requirements in fall**. (CDFG p. 73)...

(SWRCB p.98-99) SWRCB recommends (expressing)…flow criteria…as a percentage of unimpaired flow (…to more closely reflect the variation of the natural hydrograph) -- unimpaired flow estimates used (to develop) …these flow criteria are based on…DWR's: *California Central Valley Unimpaired Flow Data Fourth Edition Draft* (DWR 2007) that estimates the monthly flow for 24 sub-basins in the Central Valley…the methods change over the period of record to incorporate changes to infrastructure within the sub-basins…Estimates are provided for 83 water years from 1922 through 2003.

**Ideal rearing habitat conditions for (Delta smelt) are believed to be shallow water areas most commonly found in Suisun Bay**. (SWRCB p. 107) Outflows that locate X2 in Suisun Bay (mean April through July location) produce the highest delta smelt abundance levels; however, low abundances have also been observed under the same conditions, which indicates several mechanisms must be operating…A criterion of 75% of unimpaired flow is expected to place X2 in Suisun Bay from March through June in nearly all years…The DFG's current science-based conceptual model is that **placement of X2 in Suisun Bay represents the best interaction of water quality and landscape for fisheries production given the current estuary geometry…Implementation of the 75% of unimpaired flow criteria would be largely consistent with the intent of the DFG's recommendations by placing X2 between Chipps Island and**

**Port Chicago, or further to the west, in nearly all years during the January through June period**…

...the magnitude, duration, timing, and source of San Joaquin River inflows are important to **Chinook salmon** migrating through the Bay-Delta and several different aspects of their life history. **Inflows are needed to provide appropriate conditions to cue upstream adult migration to the San Joaquin River and its tributaries, adult holding, egg incubation, juvenile rearing, emigration from the San Joaquin River and its tributaries, and other functions** (for)…fall-run Chinook salmon (and spring-run when they are reintroduced)**…the San Joaquin River inflow criteria included in this report focus on flows needed to support migrating fall-run Chinook salmon from and to natal streams through the Delta**…

…**flows of 3,000 to 3,600 cfs for 10 to 14 days are needed during mid to late October to reduce straying, improve olfactory homing fidelity, and improve gamete viability for San Joaquin basin returning adult Chinook salmon**…These flows could also be provided in a manner that better reflects the natural hydrograph to coincide with natural storm events. Until additional information is developed, maintaining the October pulse flow called for in the 2006 Bay-Delta Plan is also determined to be a Category B criterion to assure that the existing protection provided during this period is not diminished…

(SWRCB p. 121) Given that salmon and steelhead may be present in the San Joaquin River and its tributaries for all or most of the year (including spring-run in the future) and that **the Bay-Delta plan does not currently include any flow requirements from July through September and November through January**, additional flow criteria for the remainder of the year may be needed to protect Chinook salmon and their habitat. Net flow (i.e., flows adjusted for tides) in the lower San Joaquin River in the western Delta (QWEST) has been used in past biological opinions to define conditions necessary for successful juvenile Chinook salmon migration (i.e., survival) through the Delta. The Qwest parameter may also be pertinent to delta smelt and other species (NMFS 1993). A strongly positive Qwest is used as an indicator of successful transport of longfin smelt larvae out of the lower San Joaquin River… (CDFG p. 20-21)

Chinook salmon show remarkable phenotypic plasticity in their ability to adapt to new locations and form multiple life history types from a single introduction of fish (Williams 2006); with restoration of tidal marsh in the Delta, Chinook salmon in the Sacramento and San Joaquin rivers may be able to regain varied life history types over time. (CDFG p. 39)...

**Central Valley Streamflows**…(CDFG p. 14) **There is no one correct flow number…Seasonal, interannual, and spatial variability, to which native species are adapted, are as important as quantity**. SWRCB and DFG have recently assessed Delta flows…and developed flow requirements for the Delta and its tributaries…*Draft Technical Report on the Scientific Basis for Alternative San Joaquin River Flow and Southern Delta Salinity Objectives* **details the scientific basis for their flow recommendations**… (CDFG p. 16-17)

**Delta Floodplain.** Managing the frequency and duration of floodplain inundation during the winter and spring, followed by complete drainage by the end of the flooding season could favor native fish over non-natives…and reduce nuisance insect problems. Frequency, timing, and duration of inundation are important factors that influence ecological benefits of floodplains. **To favor splittail recruitment and benefit salmon fry and smolt growth, DFG recommends during above normal and wet years, once 10 days of floodplain inundation have been achieved based on runoff and discharge from upstream reservoirs between January 1 and May 30, then reservoir discharges should be continued to maintain uninterrupted inundation for at least 30days in the Yolo Bypass and at suitable locations in the Sacramento River or the San Joaquin River.** (CDFG p. 35-36)

**Temperature.** It may not be possible to attain the outflow criteria and meet the thermal needs of the various runs of Chinook salmon and other sensitive species in certain years. Water supply modeling and temperature analyses should be conducted to identify conflicting requirements to achieve both outflow and cold water temperature goals. (SWRCB p. 107-108).

Major factors that increase water temperature and negatively impact the health of the Delta are disruption of historical streamflow patterns, loss of riparian vegetation, reduced flows released from reservoirs, and discharges from agricultural drains…It may be difficult to manage water temperatures in the Delta because **Delta water temperatures are driven mainly by ambient air temperature. With expected localized warming of air temperatures due to regional climate change, particularly in summer, the problem of maintaining sufficiently low water temperatures in the Delta to sustain native species will become more problematic. While creating patches of riparian habitat may help cool water in small Delta sloughs through shading, and creating tidal marsh habitat may help cool water locally through nocturnal inundation of marsh plains, managers should seek to facilitate fish access to the water temperature conditions they require rather than focusing resources to achieve water temperatures in a specific area**. (CDFG p. 52)...The ERP implementing agencies continue to believe that one critical factor limiting anadromous salmon and steelhead population abundance in the SJBPA is the high water temperatures that exist during critical life stages in the east-side tributaries and the mainstem of the San Joaquin River. (CDFG p. 155)

**Stage 2 Actions for Water Temperature: Action 1:** Maintain water temperatures in the San Joaquin River and its tributaries that are beneficial to anadromous fish species…**Action 2:** Modify the operations of reservoirs to aide in the maintenance and restream riparian vegetation as warm-water inputs…
**Action 3:** Manage storage of and release San Joaquin River tributaries to ensure the duration of cool temperatures are supportive of spawning, egg survival, and rearing of juvenile salmonids.

For many estuarine species…the mid-range and upper limits of beneficial flows far exceed flows that could be provided by State and federal water projects. Such flows typically occur in above normal and wet years when project operations are not controlling flows. (CDFG *Quantitative*...p. 34)
[TJV]: I don't understand this statement. Given that the whole ecosystem is straight-jacketed with infrastructure, don't "project operations" control all flows at all times? And if we're fortunate to have an above normal or wet year, wouldn't we want X2 positioned as far downstream as possible to at least approximate the historic hydrograph?

## NUMERICAL TARGETS TO FOR FLOWS & SALINITY TO PROTECT FISHES

…it appears that winter-spring outflows designed to be protective of **longfin smelt** would benefit the other upper estuary species evaluated. DFG recommended that spring outflows extend through June to fully protect a number of estuarine species. **During June, sufficient outflow should be provided to maintain X2 in Suisun Bay (between 75 km and 64 km)**...SWRCB determines…that 75% of 14-day average unimpaired flow is needed during the January through June time period to promote increased abundance and improved productivity for longfin smelt and other desirable estuarine species. However, this criterion could serve as the basis from which future analysis and adaptive management could proceed.

The **USFWS Opinion…calls for maintaining X2 in the fall of wet years and above normal years at 74 km and 81 km**, respectively…(SWRCB p. 109)...The NAS (2010) commented on…the USFWS Opinion and concluded: **The action also may have high water requirements and may adversely affect salmon and steelhead under some conditions**. As a result, how specific X2 targets were chosen and their likely

beneficial effects need further clarification."… Absent study results demonstrating the importance of fall X2 to the survival of delta smelt, fall flows beyond those stipulated in **the fall X2 action for the protection of Delta smelt are not recommended at this time**.
…given the impediments to fish passage into historic spawning and rearing areas, there may also be a need to diverge from the natural hydrograph at certain times of year to provide more flow than might have naturally occurred, or less flow such that those flows are available at other times of year to mitigate for passage and habitat issues (e.g. cold water pool management). (SWRCB p.115)… Given the extensive modifications to the system, there may be a need to diverge from the natural hydrograph at certain times of the year to provide more flow than might have actually occurred to compensate for such changes. )...Fall outflow criteria, intended to improve conditions for Delta smelt by enhancing the quantity and quality of habitat in wet and above normal water years, represent such an instance…

**SWRCB is not advancing criteria for increased fall flows in Critical, Dry, and Below Normal water year types beyond those required in the 2006 Bay-Delta Plan, and in Above Normal and Wet water year types beyond those stipulated in the fall X2 action**. (SWRCB p.113). SWRCB **determines that sufficient outflow is needed from September through November of wet and above normal water year types to position X2 at less than or equal to 74 km and 81 km, respectively (Fall X2 action)…The quantity and timing of fall outflows necessary to protect public trust resources warrants further evaluation.**

**Delta Outflows**
1) Net Delta Outflow: 75% of 14-day average unimpaired flow for January through June
**2) Fall X2 for September through November**
· Wet years X2 less than 74 km (greater than approximately 12,400 cfs)
· Above normal years X2 less than 81 km (greater than approximately 7,000 cfs)
3) 2006 Bay-Delta Plan Delta Outflow Objectives for July through December

**San Joaquin River** (SWRCB p. 119)
1) San Joaquin River at Vernalis: 60%of 14-day average unimpaired flow from February through June
2) San Joaquin River at Vernalis: 10 day minimum pulse of 3,600 cfs in late October
3) San Joaquin River at Vernalis: 2006 Bay-Delta Plan flow objective for October

During their upstream migration, adult Chinook salmon require adequate streamflows sufficient to provide olfactory and other orientation cues to quickly locate their natal streams. Adequate streamflows are necessary to allow adult passage to upstream holding habitat. The preferred temperature range for upstream migration is 38°F to 56°F (3°C to 13°C). (CDFG *Quantitative*...p. 38).

[TJV]: The following numerical tables should be printed out and compared:
http://www.dfg.ca.gov/water/water_rights_docs.html
• Table 5: USEPA Temperature thresholds for salmon (CDFG *Quantitative*...p. 51)
• Table 6: Delta Flow needed to double salmon smolt production at Chipps Island (CDFG *Quantitative*...p. 52)
• DFG Recommended Flow Criteria for Salmon (CDFG *Quantitative*...p. 60-62)
• Table 7: Delta Outflow recommendations for Longfin Smelt (**X2 – 64 km to 75 km**) (CDFG *Quantitative*…p. 65)
• DFG Recommended Flow Criteria for Longfin Smelt (CDFG *Quantitative*...p. 60-62)
• Table 9. Summary of the Recommendations for Delta Outflows to Protect Delta Smelt (SWRCB 2010) (CDFG *Quantitative*...p. 73 + p. 79)
• **Table 15: DFG Flow Criteria by geographical region linking X2 positions with flows in cfs.**

(CDFG *Quantitative*...p. 105-107)

❖ [TJV] In wet and above normal years, why should the resource agencies (and the fishes!) settle for an X2 greater than 74 km? If we can't achieve 65 km in wet and above normal years, then when would we seek this best isohaline position?

- When X2 = 65 km below Roe Island, the LSZ = 7704 hectares (of the **best** shallow habitat remaining in the BDE)
- When X2 = 74 km at Chipps Island, the LSZ = 9140 hectares (**but** LSZ squeezed into smaller Honker Bay).
- When X2 = 81 km at the confluence, the LSZ is confined to deep river channels and = 4914 hectares.
- When X2 = 85 km near Antioch and is disconnected from Suisun Bay and Marsh, and = 4262 hectares.

## FLOODPLAIN PROTECTION, RESTORATION, AND MANAGEMENT

**RR P2** The following areas shall not be encroached upon because they are critical floodplains and may also provide ecosystem benefit…(DSC p.165)...reestablish floodplain inundation and channel-floodplain connectivity of sufficient longitudinal extent, frequency, timing, duration, and magnitude to support the restoration and maintenance of functional natural floodplain, riparian, and riverine habitats….increase the extent of freely meandering reaches and other pre-1850 river channel forms to support the restoration and maintenance of functional natural riverine, riparian, and floodplain habitats…

The vision for the future restored Delta ecosystem includes greater habitat heterogeneity and restoration of expansive intertidal habitats throughout the Delta and floodplain habitats along rivers that are highly diverse, connected, accommodate natural geomorphic processes, and provide high quality habitats for native species. This vision **necessitates acquisition of riverside properties, setting back or flattening levees to enhance river meander and restore erosion and deposition processes, and allowing fish access to floodplains**. (CDFG p. 6) With increasing sea level, global warming, and regional climate change, uplands adjacent to Delta tidal fresh and brackish wetlands will be important for future uphill colonization of these wetlands…**protection of (Delta Upland Areas) from ongoing conversion to urban uses** should be a high priority to allow adaptation to climate change and maintain sustainable natural aquatic communities into the future. (CDFG p. 34)

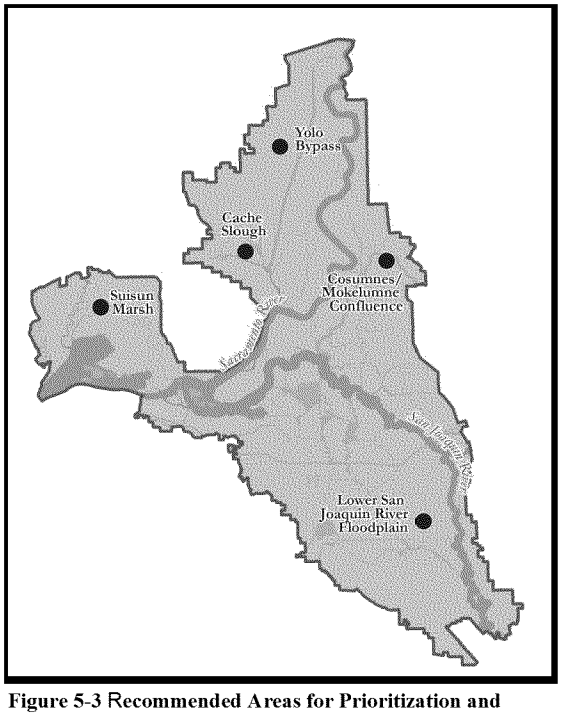
**Immediate Funding Recommendations…Flood Management and Prevention** (DSC p.210)
**FP R3** The Legislature should appropriate $50 million of Proposition 1E funds to the Department of Water Resources and direct the Department of Water Resources to begin the acquisition of land and easements for the proposed San Joaquin/South Delta Flood Plain.

❖ [TJV] EPA, the Corps, SWRCB and the Water Boards should exercise CWA §404 and 401 authorities to establish special regulatory protections that prevent encroachment upon - and development within - priority floodplains while agencies and NGOs finish comprehensive flood management plans, acquire easements for beneficial bypasses, pursue the set-back or breaching of levees, etc.

## HABITAT RESTORATION

**ER P2 Habitat restoration actions shall be consistent** with the…***Conservation Strategy for Restoration of the Sacramento-San Joaquin Delta Ecological Management Zone and the Sacramento and San Joaquin Valley Regions*** *(DFG 2011)*… (DSC p.117) **ER R1** The DSCI…**recommends the prioritization and implementation of habitat restoration projects in the following areas**…Where possible, restoration projects should emphasize the potential for water quality improvement…(DSC p.119-124)

**[Salmon] fry seek nearshore habitats containing riparian vegetation and associated substrates** important for providing aquatic and terrestrial invertebrates, predator avoidance, and slower velocities for resting (NMFS 1996). **Shallow water habitats have been found to be more productive for salmon rearing than the main river channels**, supporting higher growth rates, partially due to higher prey consumption rates, as well as favorable environmental temperatures (CDFG *Quantitative*...p. 40)
Fry and parr may rear within riverine or estuarine habitats of the Sacramento River, the Delta, and their tributaries (Maslin et al. 1997, Snider 2001). **Within the Delta, juvenile Chinook salmon forage in shallow areas with protective cover, such as intertidal and subtidal mudflats, marshes, channels, and sloughs**. (CDFG *Quantitative*...p. 41)



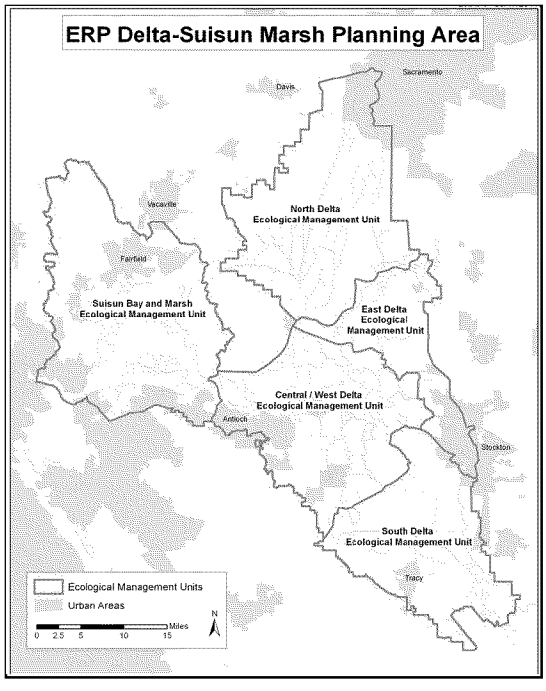




**Figure 5-3 Recommended Areas for Prioritization and and Implementation of Habitat Restoration Projects** *DFG 2011*

**North Delta** Yolo Bypass from Fremont Weir through Cache Slough to the Sacramento River including the confluence of Putah Creek…Cache Slough Complex, Yolo Bypass, Calhoun Cut E.R.
**Action 1:** Restore 50-100 miles of tidal channels in the Yolo Bypass by constructing a network of channels within the Yolo Bypass that connect to the Delta. Channels should effectively drain all flooded lands in the bypass after flood flows cease entering the bypass from Fremont and Sacramento Weirs. (CDFG p. 92)

**Suisun Bay and Marsh** "Upper Transition Corridor" connecting the Cache Slough Complex to northeastern Suisun Marsh…mosaic of perennial grasslands and vernal pools (CDFG p. 78-81). Hill Slough Restoration Project (Suisun Marsh region)… rehabilitate natural processes to create and maintain complex channel morphology, in-channel islands, and shallow water habitat in the Delta and Suisun Marsh.

**Eastern Delta** The Cosumnes River-Mokelumne River Confluence, as defined by the North Delta Flood Control and Ecosystem Restoration Project (McCormack-Williamson), or as modified in the future… Cosumnes-Mokelumne confluence

**Central and Western Delta** Dutch Slough.

**San Joaquin River and Basin** ♦ The Lower San Joaquin River Floodplain Bypass, upstream of Stockton immediately southwest of Paradise Cut on lands both upstream and downstream of the Interstate 5 crossing. **RR R1** The Legislature should fund DWR and the Central Valley Flood Protection Board to evaluate and **implement a bypass and floodways on the San Joaquin River near Paradise Cut** that would reduce flood stage on the mainstem San Joaquin River adjacent to the urban and urbanizing communities of Stockton, Lathrop, and Manteca in accordance with Water Code section 9613(c). (DSC p.166) Lower San Joaquin River: The designation of the proposed the *Lower San Joaquin River Floodplain Bypass* Proposal involves a settlement and partnership among the South Delta Water Agency, the River Islands Development Company, RD 2062, San Joaquin Resource Conservation District, American Rivers, the American Lands Conservancy, NRDC, (and the South Delta Levee Protection and Channel Maintenance Authority?) (http://www.americanrivers.org/our-work/restoring-rivers/floods-floodplains/lower-san-joaquin-river-flood.html)

San Joaquin Valley Region (CDFG p. 138): **Action 1:** Support SWRCB's efforts to establish flow requirements that provide sufficient flows to inundate floodplains during critical late winter and early spring periods. **Action 2:** Floodplains should be reestablished by setting flow requirements, constructing setback levees, and removing other obstacles. **Action 3:** Pursue opportunities to allow reconnection of historic floodplain, with minimal impacts to private property. (CDFG p. 145) **Action 1:** Coordinate with other programs such as San Joaquin River Restoration Program and DWR's FloodSafe program to aide in the restoration of functional riparian corridors and reestablish flood plains.

**Upper Sherman Island**

**East Side Tributaries**

## METHYLMERCURY AND HABITAT RESTORATION

More than 97% of identified total mercury loading to the Delta and Yolo Bypass comes from tributary inputs…in-Delta sources are a very small component of overall loading. Mercury can enter streams or aquatic systems through either atmospheric deposition or transport from geological or man-made sources. (CDFG p. 111)...The Sacramento Basin, which comprises the Sacramento River and Yolo Bypass tributary watersheds, contributes 80% or more of total mercury fluxing through the Delta. Of the watersheds in the Sacramento Basin, the Cache Creek and upper Sacramento River (above Colusa) watersheds contribute the most mercury. The Cache Creek, Feather River, American River, and Putah Creek watersheds in the Sacramento Basin all have relatively large mercury loadings and high mercury concentrations in suspended sediment…

(DSC p.145-) Preliminary mass balance calculations indicated a net loss of methylmercury in water as it flows through the Delta, meaning that the Delta acts as a net sink for methylmercury……water and fish monitoring data have shown that the central Delta is actually lower in methylmercury concentration than tributary areas (e.g., the Yolo Bypass and Sacramento, Cosumnes, and San Joaquin rivers)…

The most important sites of microbial methylation in the Bay-Delta ecosystem are generally oxic-anoxic (oxygenated and anaerobic) interfaces in aquatic sediments, wetlands, and seasonally inundated vegetated habitats... The main causes of methylmercury loss are currently thought to be photodemethylation and sedimentation. (DSC p.145-)...**The periodic wetting and drying of floodplain areas make these areas especially prone to methylmercury production and transport**…potential mercury methylation from

actions to create or enhance important aquatic habitats, or from other actions geared toward increasing turbidity or primary production, must be weighed against the negative impacts associated with not restoring critical aquatic habitat types and recover species. (CDFG p. 60)
…Management of (MeHg) must be addressed in all aquatic restoration activities. (CDFG p. 22)...**floodplain restoration activities should include the investigation and implementation of Best Management Practices (BMPs) to control methylmercury production and/or transport**. (CDFG p. 37)...**restoration of tidal marsh within intertidal land elevations should be designed as large-scale experiments, and should be rigorously monitored** to establish relationships between this habitat and species population abundance… **Improvement of the sediment trapping efficiency of the Cache Creek Settling Basin** was identified as one of the most cost-effective ways to reduce loads of mercury and methylmercury in the Yolo Bypass… (CDFG p. 58).

Reducing MeHg production and/or translocation is key to reducing its concentration in Delta waterways:
• Participating in the Water Boards TMDL programs for mercury and methylmercury in the Delta.
• Developing and implementing TMDLs in areas upstream of the Delta to reduce loads of organic and inorganic mercury entering the Delta from tributary sources.
• Developing BMPs to control the production of methylmercury at aquatic habitat sites, and to control the transport of methylmercury into the system. (CDFG p. 59)

❖ [TJV] Every location targeted for wetlands restoration is impaired by mercury, and restoration activities could significantly increase the formation and mobilization of MeHg. This doesn't mean we should not pursue large-scale wetlands restoration because the benefits are likely to outweigh the costs. EPA should articulate an interdivisional strategy (melding Air, Water, and Superfund authorities) to both reduce ongoing inputs while remediating the mercury already in the system. Strategies could include *in situ* capping, emergency removal actions, NPL listings, tightened regulations for air deposition. A more specific action follows:

❖ [TJV] When I asked Jacob Fleck (USGS) for advice on whether we should pursue emergency removals or remediatin of mercury at the Cache Creek Settling Basin and the Marsh Creek reservoir, he recommended first exploring mercury atmospheric inputs to the BDE from oil refineries, international sources (Chinese coal-fired power plants), cement plants, etc. Air deposition may be a significant ongoing source, and addressing it through work by EPA and CARB might need to be part of a comprehensive package of source control (in addition to reducing discharges of AMD from "legacy mines").

❖ [TJV] For projects where Region 9 holds some leverage (i.e., Dutch Slough on Marsh Creek), EPA should incorporate "large-scale experiments into restoration designs" and advance the goal of "rigorous monitoring" for these sites.

## SUBSIDENCE OF DELTA ISLANDS & LOSS OF PEAT SOILS

• **strengthening of levees will not be a sustainable solution for all Delta islands**;
(CDFG *Quantitative*...p. 5)... the areas of the Delta that are of **highest priority** for restoration include lands that can be seasonally inundated, and transitional and upland habitats. The **next highest priority** for restoration to tidal marsh would be lands below the intertidal range that are not highly subsided, and are within the range of feasibility for subsidence reversal projects...**The most subsided lands would be the lowest priority**. (CDFG p. 31)

Central Valley Joint Venture (2006) recognizes that agricultural easements to maintain waterfowl food supplies and buffer existing wetlands from urban development may become increasingly important in basins where large increases in human populations are predicted. In addition, ongoing rice cultivation may help minimize subsidence. **Subsidence reversal, carbon sequestration, and wildlife friendly agricultural projects are appropriate on these deep islands in the near term**, as they are expected to provide benefits to the local economy, wildlife, and waterfowl while protecting lands from uses that may be unsustainable over the longer term. (CDFG p. 42)

The USGS is interested in implementing a subsidence reversal program Delta-wide, given the results of their Twitchell Island pilot study. Such a program would involve offering financial incentives to landowners to create and manage wetland areas on their lands (Fujii 2007). Large-scale, whole-island approaches to reversing subsidence would be beneficial for multiple purposes. Programs that offer incentives for 10- or 20-year studies for subsidence reversal on large tracts of land could help improve Delta levee stability and reduce the risk of catastrophic failure. Assuming that accretion rates continue at about four inches annually, estimates suggest a 50 percent reduction in accommodation space in 50 years if subsidence could be pursued throughout the Delta This reduction in accommodation space jumps to 99 percent over the next 100 years (Fujii 2007).

**Stage 2 Actions for Subsided Lands/Deep Open Water Areas:**
**Action 1:** Implement wildlife-friendly agriculture
**Action 2:** Secure easements and land (for subsidence reversal projects)...
**Action 3:** Continue research on the creation and management of deep open water areas (e.g., Liberty Island) to evaluate physical and biological properties and species use. (CDFG p. 42)

Some deeply subsided lands could also be used as disposal sites for clean dredged sediments, providing local flood control improvements while helping raise land elevations on subsided lands more quickly. This accommodation space reduction, in addition to helping stabilize levees over the longer term, would create additional areas for restoration of additional tidal marsh habitat. (CDFG p. 43)...

**RR R2** The current efforts to maintain navigable waters in the Sacramento River Deep Water Ship Channel and Stockton Deep Water Ship Channel, led by (the Corps) and described in the Delta Dredged Sediment Long-Term Management Strategy, should be continued in a manner that supports the Delta Plan and the coequal goals. Appropriate dredging throughout other areas in the Delta that would increase flood conveyance and provide potential material for levee maintenance or subsidence reversal should be implemented in a manner that supports the Delta Plan and coequal goals.

(DSC p.183) **RR R11** State agencies should not renew or enter into agricultural leases on Delta or Suisun

Marsh islands if the actions of the lessee promote or contribute to subsidence on the leased land, unless the lessee participates in subsidence-reversal or reduction programs.

❖ [TJV] EPA, the Corps, SWRCB and the Water Boards should exercise CWA §404 and 401 authorities to pre-empt the development of lands and waters that are essential for the recovery of the BDE.

❖ [TJV] The ERP and CDFG's Conservation Strategy (and the PPIC for that matter) have ranked as the lowest restoration priority the most subsided lands of the Delta. In EPA's Response Document, we need to decide whether we agree with this ranking, and, if not, we need to say so and explain why. In my opinion, restoring the most subsided interior Delta would be the highest priority because the peat soils represent a unique wetland type for CA, they are the most vulnerable to permanent loss, and they currently support infrastructure and cultural assets that would be difficult to replace.

❖ [TJV] EPA should **establish an ecosystem services pilot project** on Twitchell Island in partnership with DWR and USGS whereby a localized "market" is created that pays farmers to grow peat-building tules rather soil-ravaging feed corn (http://epa.gov/ord/esrp/). Currently, EPA's ecosystem services program seems dormant, and in need of revitalization.

❖ [TJV] Greg Sutter, Westerveldt Mitigation Banking, recommended growing year-round, wild rice varieties on selected Delta Islands rather than the usual rice varieties that are seasonally drained. This might curb MeHg production & transport, reverse subsidence of peat soils, and increase recreation opportunities for duck hunters. Greg said wild rice was already being grown in some areas of the Delta, and could be scaled-up.

## LEVEE MAINTENANCE

**ER R4** Considering the ecosystem value of remaining riparian and shaded riverine aquatic habitat along Delta levees, the (Corps) should work with (CDFG and DWR) **to develop and execute an agreed-upon variance process to exempt Delta levees from the U.S. Army Corps of Engineers' levee vegetation policy** where appropriate. (DSC p.) **Stage 2 Actions for Riparian and Riverine Aquatic Habitat**
**Action 4:** Identify levee-confined channels and banks where routine vegetation removal by local reclamation districts can be safely discontinued.
**Action 5:** Establish weed control programs to suppress the expansion of tamarisk, giant reed, locust, and other invasive non-native plants degrading habitat quality and native flora. (CDFG p. 96)
**Stage 2 Actions for Upland Areas: Action 5:** Restore large-scale riparian vegetation along waterways wherever feasible, including opportunities for setback levees.

❖ [TJV] Per CWA §404 and 401, we should work with the Corps and SWRCB to formulate a special designation for levees supporting native, riparian forest within the BDE watershed and/or secure a waiver from the Corps to the national levee clearing policy. We should also use this opportunity to accelerate the eradication and replacement of invasive species on the levees.

## STORMWATER

**Stormwater Runoff**. The State's goal is to increase capture and reuse of stormwater by at least 500,000 acre-feet per year by 2020, and at least 1 MAF per year by 2030. The 2008 Scoping Plan for California's Global Warming Solutions Act of 2006 (AB 32) finds that up to 333,000 acre-feet of stormwater could be

captured on an annual average for reuse in Southern California alone. (DSC p.80)… Sources of pollution in the Delta include point and nonpoint sources, such as agricultural runoff, urban runoff, wastewater treatment plant discharges, and abandoned mines. (DSC p.134)

**WR R4** All state agencies should…design and retrofit state owned and leased facilities…to increase water efficiency, use recycled water, incorporate stormwater runoff capture and low impact development strategies, and reduce reliance on the Delta. The DSC will work with these agencies to identify regulations and other policies that will support the improved water efficiencies and new water supply strategies, such as completion of uniform recycling criteria for potable reuse for groundwater recharge, consistent with SB 918 (Water Code section 13521 32 et seq.).

❖ [TJV] EPA should propose and/or support quantitative targets for capturing X inches of stormwater during Y rainfall events in the counties immediately surrounding the BDE, and articulate a position on linking LID with permitting under 401, 402, and 404. Erin has drafted some great ideas on this topic that deserve group discussion.

❖ [TJV] Consistent with DSC's proposal for designing and retrofitting State "owned and leased facilities," EPA should work with GSA to articulate a similar policy for federal owned and leased facilities.

## MULTIPLE STRESSORS

**Ammonia.** Tidal marsh may also help improve the pelagic food web by reducing the concentration of ammonium in the water. Ammonium has been shown to inhibit phytoplankton blooms in Suisun Bay and possibly other open-water habitats in the Delta by inhibiting the uptake of nitrate by diatoms (Wilkerson et al. 2006, Dugdale et al. 2007). (CDFG p. 40-41) In a nutrient-rich estuary in Belgium, tidal freshwater marsh was shown to transform or retain up to 40 percent of ammonium entering the marsh during a single flood tide (Gribsholt et 2005). Nitrification (the conversion of ammonium to nitrate) accounted for a large portion of the transformation (30 percent)…Increased tidal marsh habitat may, therefore, improve the base of the aquatic food web in the Delta by increasing primary production within the marshes, and by increasing the ratio of nitrate to ammonia in the estuary. (CDFG p. 41)...

Restoration actions that improve Delta primary production could help to increase zooplankton production and augment the pelagic food web. Such actions include increasing water residence times (e.g., creating deadend sloughs, floodplain inundation) to allow for phytoplankton accumulation, **reducing inputs of ammonium** and other contaminants by improving wastewater treatment practices, reducing agricultural chemical runoff through better farming practices, and restoring additional wetlands and tidal marshes to increase nitrification rates to remove ammonium from the system. (CDFG p. 28)...Determine potential impacts of ammonium and other contaminants on primary productivity (studies underway by State and Regional Water Quality Control Boards).

**Contaminants.** Continue coordination and support for the TMDL and associated implementation to address dissolved oxygen depletion in the lower San Joaquin River.

**Dissolved Oxygen.** There is evidence that low DO levels in the San Joaquin River- Stockton Deep Water Ship Channel (DWSC) can create a migration barrier for fall-run Chinook salmon. In addition to impairment of fish production, migration, and juvenile rearing, low DO is a potential cause of mortality in other aquatic organisms (CALFED 2000a, b)…A barrier is installed in the fall each year to increase flow in the mainstem San Joaquin River and improve DO conditions in the vicinity of Stockton. (CDFG p. 54)

**Non-native Invasive Plants.** It is hypothesized that periodic salinity intrusion into the Delta may help to reduce the abundance and/or distribution of certain harmful invasive species, and give native species a competitive advantage. (CDFG p. 52) …restored tidal marsh would be colonized by non-native species, which would in turn limit the benefits to native species…
❖ [TJV] Personal observation: *Phragmites* is invading Suisun Marsh at an alarming rate? If we haven't already commented on the pending management plan for Suisun Marsh, EPA should recommend the systematic eradication of this plant from the Marsh.

**Non-native Invasive Species.** Because the overbite clam and Asian clam have become so well-established in the estuary, there is currently no known environmentally acceptable way to treat or remove these invertebrates (DFG 2008a). **The only apparent management action at this time is to determine whether the manipulation of environmental variables, such as salinity, be used to seasonally control their distribution in the estuary…There is not consensus among scientists that manipulation of salinity would do much to affect the distribution of these clams or diminish their impacts on the estuarine food web. Many experts believe that the distribution and impacts of invasive clams cannot be controlled (CALFED Science Program 2008).** (CDFG p. 50)

❖ [TJV] This seems like a perfect thing for IEP to study, and we need a Team discussion about how to frame issue/opportunity in the Response Document. PPIC seemed rather unequivocal that managing salinity could help us manage the colonization and proliferation of invasive flora and fauna, and only my reading of the CDFG document did I note an apparent lack of consensus.

**Pesticides.**
Pyrethroid pesticides are less acutely toxic to vertebrates, but are more difficult to detecin water due to their tendency to adsorb strongly to sediment particles. Pyrethroid pesticides can have sub lethal effects to aquatic vertebrates and lethal effects to invertebrates, and are believed to be one of the factors contributing to the pelagic organism decline. (CDFG p. 55)

**Selenium.**
…Continue to monitor selenium levels and identify point sources within the San Joaquin River Valley Region…Maintain selenium concentration within the San Joaquin Valley Region at a level that is not detrimental to fish and wildlife.

## MONITORING

**WQ R7** SWRCB and the Regional Water Boards should work collaboratively with DWR, CDFG and other agencies and entities that monitor water quality in the Delta to develop and implement a Delta Regional Monitoring Program that will be responsible for coordinating monitoring efforts so Delta conditions can be efficiently assessed and reported on a regular basis. (DSC p.149-)

A comprehensive monitoring plan that emphasizes routine monitoring and targeted research are essential to the success of adaptive management and should be well described in the Delta Science Plan. Monitoring activities in the Delta should build upon the strengths and long-term data sets of the IEP and other regional monitoring programs. A comprehensive monitoring plan for the Delta should expand on the work of the IEP and plan for coordinated synthesis, integration, and communication beyond monitoring associated with covered actions.

**DSC Driver Performance Measures** ♦ Progress toward increasing interannual variability of salinity in Suisun Bay and Suisun Marsh. In future years, salinity will trend higher during periods of low river flow

and trend lower during periods of high river flow.

❖ [TJV] …Karen's lead for the Response Document…

## PARALLEL PLANS, POLICIES, AND REGULATORY PROCEEDINGS

* the ***Sacramento and San Joaquin Rivers Basin Plan*** (Central Valley RWQCB 1998);

* the ***Water Quality Control Plan for the Sacramento-San Joaquin Delta Estuary*** (SWRCB 2006) (Bay Delta Water Quality Control Plan). The SWRCB is reviewing the San Joaquin River flow and southern Delta water quality objectives and…and plans to complete its review by June 2012…

* the ***San Francisco Bay Basin Plan*** (San Francisco Bay RWQCB 2010). (According to DSC), implementation is best achieved through assigning responsibilities to water-right holders and water users… established in Water Rights Decision 1641…the **parameters to be controlled are significantly affected by flows and diversions**….The Bay Delta Water Quality Control Plan provides reasonable protection for beneficial uses that require control of salinity and operations of the water projects in the Delta (SWRCB 2006) (DSC p.134)

* ***Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem*** (SWRCB 2010a). This report provides an assessment of the flows needed to protect the Delta and its ecological resources, but does not address other public trust considerations. (DSC p.85)…

* CDFG's *Quantifiable Biological Objectives and Flow Criteria for Aquatic and Terrestrial Species of Concern Dependent on the Delta* (23 November 2010) http://www.dfg.ca.gov/water/water_rights_docs.html

* ***Update to Strategic Plan 2008-2012*** **(June 2010) and the** ***Strategic Workplan for Activities in the San Francisco Bay/Sacramento–San Joaquin River Delta Estuary*** (July 2008) prepared by the SWRCB, Central Valley RWQCB, and San Francisco Bay RWQCB.
• Southern Delta Salinity and San Joaquin River Flow Objectives
• Suisun Marsh Objectives (CDFG *Quantitative*...p. 7)

* *The Habitat Management, Preservation, and Restoration Plan for Suisun Marsh* (Suisun Marsh Plan)…A draft programmatic EIS/EIR is anticipated in late 2010 and will include action-specific elements (Suisun Marsh Charter Principal Agencies 2007… www.delta.dfg.ca.gov/suisunmarsh/charter/ (CDFG *Quantitative*...p. 8)

* (EPA's *Advanced Notice of Proposed Rulemaking* (2011)…EPA may make changes to programs in the Bay- Delta through a formal rulemaking process as a result of further evaluation and consideration of public comment. These changes could affect federal water quality programs administered by the State. (DSC p.135-136)

**Fish and Wildlife Service (USFWS) Delta Native Fishes Recovery Plan.*
http://ecos.fws.gov/docs/recovery_plan/961126.pdf
**NOAA Fisheries Central Valley Salmon and Steelhead Recovery Plan.*
http://swr.nmfs.noaa.gov/recovery/centralvalleyplan.htm
*NRCS' *Environmental Quality Incentive Program (EQIP) and Wetland Reserve Program (WRP);*
**Central Valley Flood Management Planning (CVFMP). DWR* (p. 177)

*FloodSAFE California http://www.water.ca.gov/floodsafe/
**Central Valley Integrated Flood Management Study. (Corps)*

* USBR's ***Adaptive Management of Fall Outflow for Delta Smelt Protection and Water Supply Reliability***